October 1999
Revised February 2005

74LCX06
Low Voltage Hex Inverter/Buffer with Open Drain Outputs

General Description

The LCX06 contains six inverters/buffers. The inputs tolerate voltages up to 7V allowing the interface of 5V systems to 3V systems.

The outputs of the LCX06 are open drain and can be connected to other open drain outputs to implement active LOW wire AND or active HIGH wire OR functions.

The 74LCX06 is fabricated with advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

Features

- 5V tolerant inputs
- 2.3V–3.6V V_{CC} specifications provided
- 3.7 ns t_{PD} max (V_{CC} = 3.3V), 10 μA I_{CC} max
- Power down high impedance inputs and outputs
- 24 mA output drive (V_{CC} = 3.0V)
- Implements patented noise/EMI reduction circuitry
- Latch-up performance exceeds 500 mA
- Functionally compatible with 74 series 05
- ESD performance:
  - Human body model > 2000V
  - Machine model > 200V

Ordering Code:

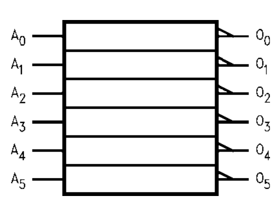
Order Number	Package Number	Package Description
74LCX06M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74LCX06MX_NL (Note 1)	M14A	Pb-Free 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74LCX06SJ	M14D	Pb-Free 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LCX06MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74LCX06MTCX_NL (Note 1)	MTC14	Pb-Free 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter “X” to the ordering code.
Pb-Free package per JEDEC J-STD-020B.

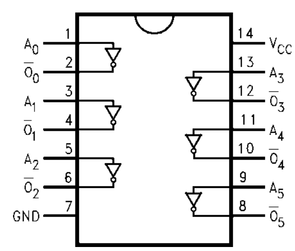
Note 1: “_NL” indicates Pb-Free package (per JEDEC J-STD-020B). Device available in Tape and Reel only.

Logic Symbol

IEEE/IEC



Connection Diagram



Pin Descriptions

Pin Names	Description
A_n	Inputs
$\overline{O}_n$	Outputs

Absolute Maximum Ratings (Note 2)

Symbol	Parameter	Value	Conditions	Units
V_{CC}	Supply Voltage	−0.5 to +7.0		V
V_I	DC Input Voltage	−0.5 to +7.0		V
V_O	DC Output Voltage	−0.5 to +7.0	Output in HIGH or LOW State (Note 3)	V
I_{IK}	DC Input Diode Current	−50	V_I < GND	mA
I_{OK}	DC Output Diode Current	−50	V_O < GND	mA
		+50	$V_O > V_{CC}$	
I_O	DC Output Sink Current	+50		mA
I_{CC}	DC Supply Current per Supply Pin	±100		mA
I_{GND}	DC Ground Current per Ground Pin	±100		mA
T_{STG}	Storage Temperature	−65 to +150		°C

Recommended Operating Conditions (Note 4)

Symbol	Parameter		Min	Max	Units
V_{CC}	Supply Voltage	Operating	2.0	3.6	V
		Data Retention	1.5	3.6	
V_I	Input Voltage		0	5.5	V
V_O	Output Voltage		0	5.5	V
I_{OL}	Output Current	V_{CC} = 3.0V − 3.6V		+24	mA
		V_{CC} = 2.7V − 3.0V		+12	
		V_{CC} = 2.3V − 2.7V		+8	
T_A	Free-Air Operating Temperature		−40	85	°C
$\Delta t/\Delta V$	Input Edge Rate, V_{IN} = 0.8V–2.0V, V_{CC} = 3.0V		0	10	ns/V

Note 2: The Absolute Maximum Ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the Absolute Maximum Ratings. The “Recommended Operating Conditions” table will define the conditions for actual device operation.

Note 3: I_O Absolute Maximum Rating must be observed.

Note 4: Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Symbol	Parameter	Conditions	V_{CC} (V)	T_A = −40°C to +85°C Min	Max	Units
V_{IH}	HIGH Level Input Voltage		2.3 − 2.7	1.7		V
			2.7 − 3.6	2.0		
V_{IL}	LOW Level Input Voltage		2.3 − 2.7		0.7	V
			2.7 − 3.6		0.8	
V_{OL}	LOW Level Output Voltage	I_{OL} = −100 µA	2.3 − 3.6		0.2	V
		I_{OL} = 8 mA	2.3		0.6	
		I_{OL} = 12 mA	2.7		0.4	
		I_{OL} = 16 mA	3.0		0.4	
		I_{OL} = 24 mA	3.0		0.55	
I_I	Input Leakage Current	$0 \le V_I \le 5.5V$	2.3 − 3.6		±5.0	µA
I_{OFF}	Power-Off Leakage Current	V_I or V_O = 5.5V	0		10	µA
I_{CC}	Quiescent Supply Current	$V_I = V_{CC}$ or GND	2.3 − 3.6		10	µA
		$3.6V \le V_I \le 5.5V$	2.3 − 3.6		±10	
ΔI_{CC}	Increase in I_{CC} per Input	$V_{IH} = V_{CC}$ −0.6V	2.3 − 3.6		500	µA
I_{OHZ}	Off State Current	V_O = 5.5	2 - 3.6		10	µA

AC Electrical Characteristics

Symbol	Parameter	$T_A = -40°C$ to $+85°C$, $R_L = 500\Omega$						Units
		$V_{CC} = 3.3V \pm 0.3V$		$V_{CC} = 2.7V$		$V_{CC} = 2.5V \pm 0.2V$		
		$C_L = 50$ pF		$C_L = 50$ pF		$C_L = 30$ pF		
		Min	Max	Min	Max	Min	Max	
t_{PZL}	Propagation Delay Time	0.8	3.7	1.0	4.1	0.8	3.5	ns
t_{PLZ}		0.8	3.7	1.0	4.1	0.8	3.5	

Dynamic Switching Characteristics

Symbol	Parameter	Conditions	V_{CC} (V)	$T_A = 25°C$ Typical	Units
V_{OLP}	Quiet Output Dynamic Peak V_{OL}	$C_L = 50$ pF, $V_{IH} = 3.3V$, $V_{IL} = 0V$	3.3	0.9	V
		$C_L = 30$ pF, $V_{IH} = 2.5V$, $V_{IL} = 0V$	2.5	0.7	
V_{OLV}	Quiet Output Dynamic Valley V_{OL}	$C_L = 50$ pF, $V_{IH} = 3.3V$, $V_{IL} = 0V$	3.3	−0.8	V
		$C_L = 30$ pF, $V_{IH} = 2.5V$, $V_{IL} = 0V$	2.5	−0.6	

Capacitance

Symbol	Parameter	Conditions	Typical	Units
C_{IN}	Input Capacitance	V_{CC} = Open, $V_I = 0V$ or V_{CC}	7	pF
C_{OUT}	Output Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}	8	pF
C_{PD}	Power Dissipation Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}, f = 10 MHz	25	pF

AC Loading and Waveforms Generic for LCX Family

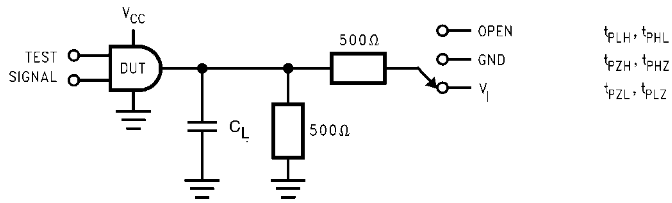
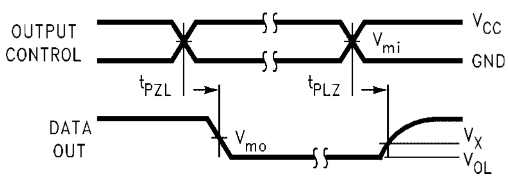
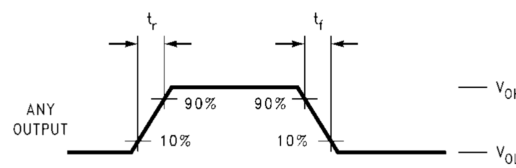


FIGURE 1. AC Test Circuit
(C_L includes probe and jig capacitance)

Test	Switch
t_{PLH}, t_{PHL}	OPEN
t_{PZL}, t_{PLZ}	6V at V_{CC} = 3.3 ± 0.3V V_{CC} x 2 at V_{CC} = 2.5 ± 0.2V
t_{PZH},t_{PHZ}	GND



3-STATE Output High Enable and Disable TImes for Logic

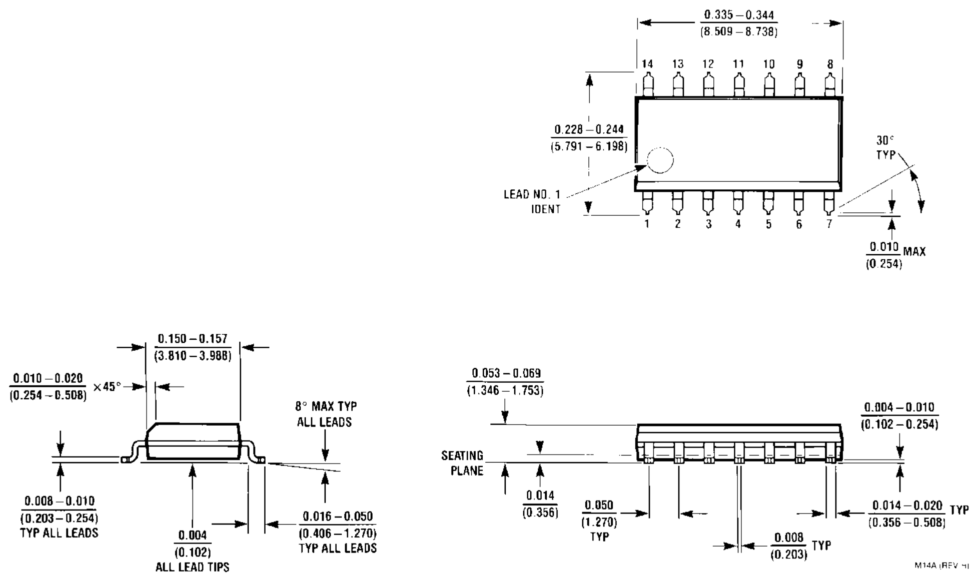


t_{rise} and t_{fall}

FIGURE 2. Waveforms
(Input Pulse Characteristics; f = 1MHz, $t_r = t_f$ = 3ns)

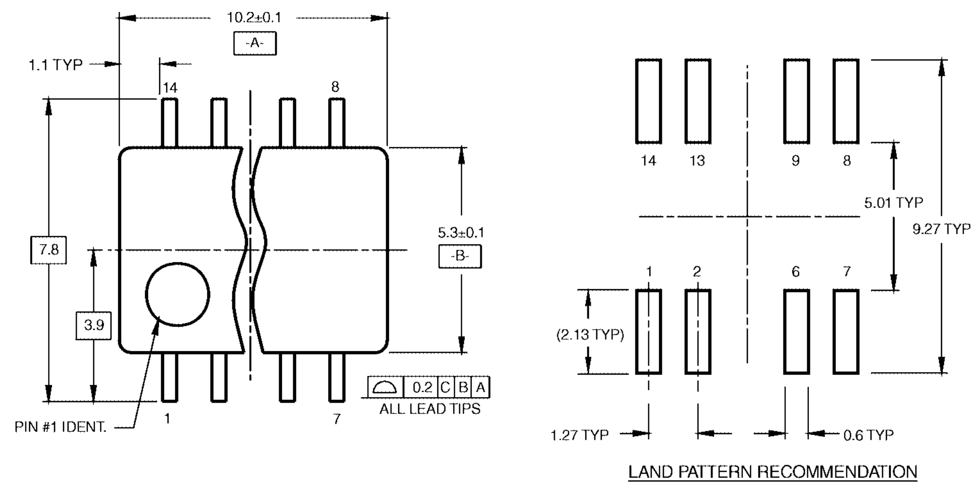
Symbol	V_{CC}		
	3.3V ± 0.3V	**2.7V**	**2.5V ± 0.2V**
V_{mi}	1.5V	1.5V	$V_{CC}/2$
V_{mo}	1.5V	1.5V	$V_{CC}/2$
V_x	V_{OL} + 0.3V	V_{OL} + 0.3V	V_{OL} + 0.15V
V_y	V_{OH} − 0.3V	V_{OH} − 0.3V	V_{OH} − 0.15V

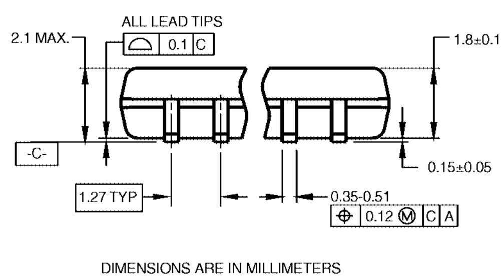
Physical Dimensions inches (millimeters) unless otherwise noted

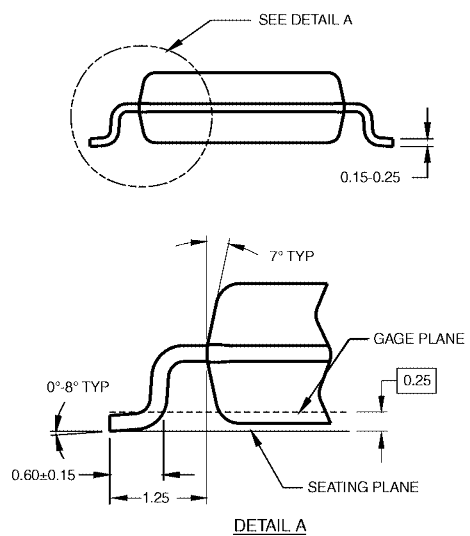


14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
Package Number M14A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)







NOTES:

A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.

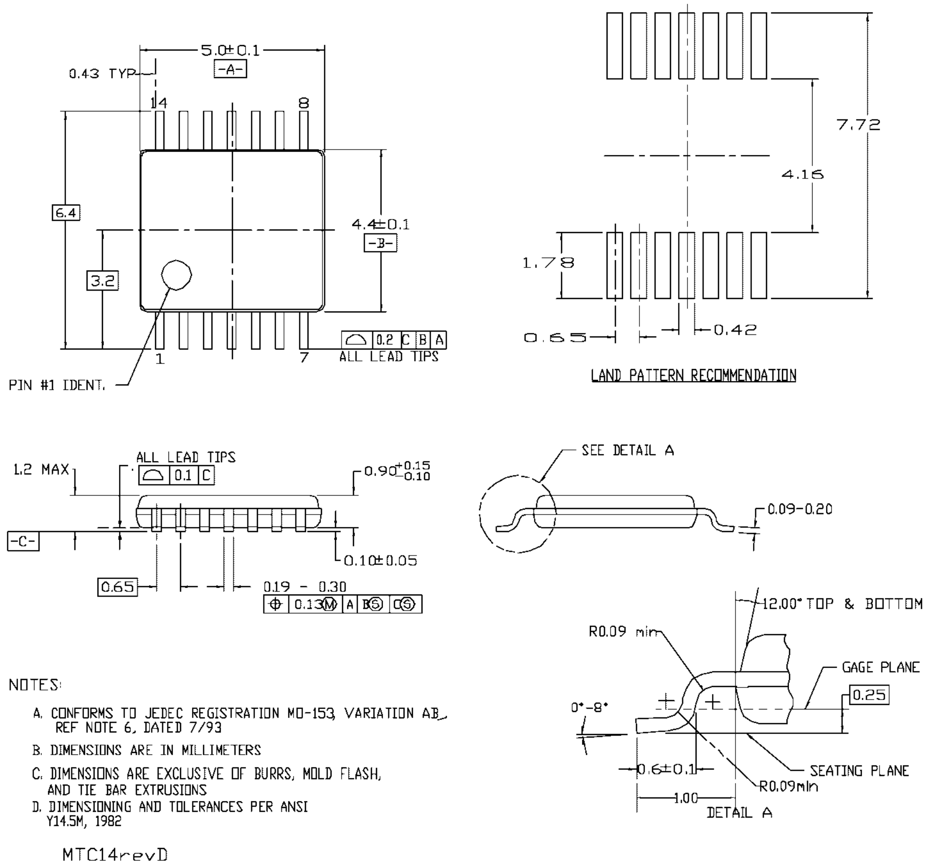
B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M14DRevB1

Pb-Free 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M14D

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
Package Number MTC14